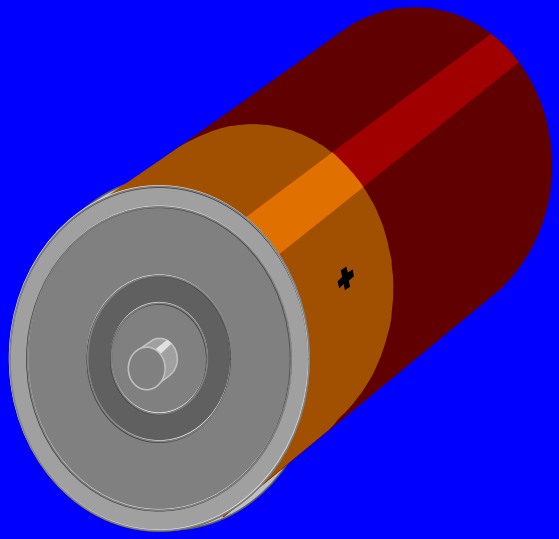
Battery Safety

CECOM

Directorate of Safety Risk Management

Training

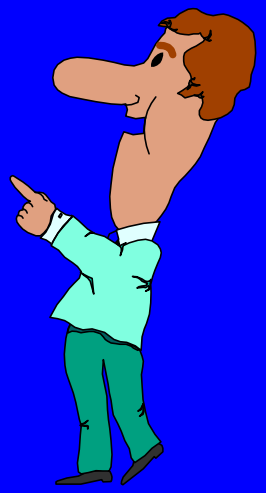
Battery Safety Topics



- Intro
- Primary Battery Issues
- Secondary Battery Issues
- What’s New!

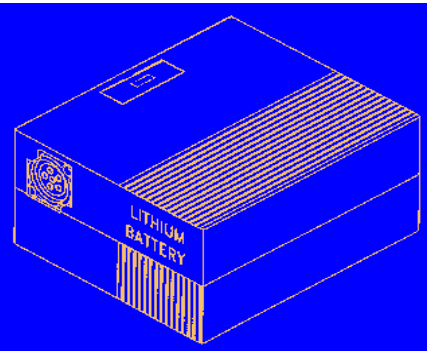
Introduction

- Purpose of this training:
  - Provide recommendations on safe battery usage based on lessons learned
  - Inform you of what to expect in the area of CECOM batteries of the future



Primary Battery Issues

AN/PRC-104B
BA-5590/U Venting



- Two BA-5590/U batteries with two different date codes installed
- The older battery violently vented when the radio began transmitting, destroying the battery compartment
- GPM 97-007 issued - end items using two or more BA-5590's must have batteries replaced in matched sets
- Recommendations (for all equipment using two or more primary power batteries):
  - Label equipment battery boxes with replacement requirements
  - Address requirements in TM and training

Standard practice is the replacement of all prime power batteries at the same time

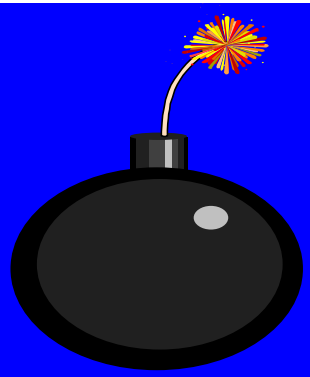
Multiple Battery Usage

- When more than one prime power battery is used, always replace in sets of new/unused batteries with the same voltage and same chemistry
- When using more than one $LiSO_2$ battery, they must be replaced in matched sets of new/unused batteries
- Matched batteries are from the same manufacturer, and have the same contract number and date code
- Bottom Line:
  - Never mix chemistry types
  - Never mix batteries with different voltages
  - Never mix primary and secondary batteries in the same equipment
  - Never mix discharged and fully charged secondary batteries
  - Never interchange battery types unless permitted by TM or approved by CECOM

AN/PSN-11
BA-5800 Battery Explosions

- Explosive incidents in the AN/PSN-11, GPS PLGR when connected to external power
- Batteries charged in the PLGR when externally powered
- GPM 96-012 issued:
  - Remove BA-5800/U when connected to external power
- Labels provided for the PLGR and TM's updated
- Secure and protect loose batteries when removed
- Recommendations: For new equipment ensure that you don't rely solely on the battery diode to prevent charging

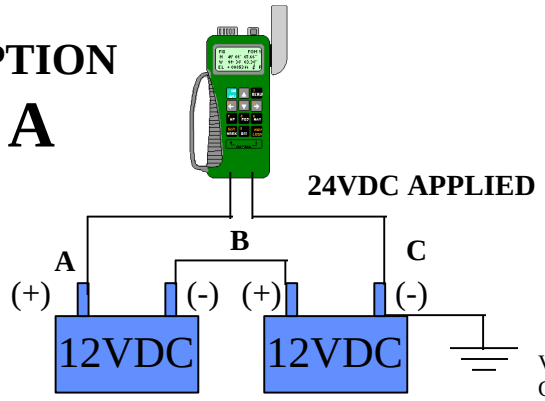
AN/PSN-11
Memory Battery Explosion



- A lithium thionyl chloride memory battery exploded when the AN/PSN-11, PLGR was improperly installed in a HMMWV
- The PLGR was improperly connected to the ungrounded negative vehicle battery terminal
- When the PLGR battery cover contacted the metal vehicle chassis, the battery shorted, causing charging and explosion
- GPM 97-005 issued providing proper PLGR installation procedures
- Wiring hookup schematics are available on our web page
- Recommendations: Ensure TM's adequately address installation procedures and possible problems

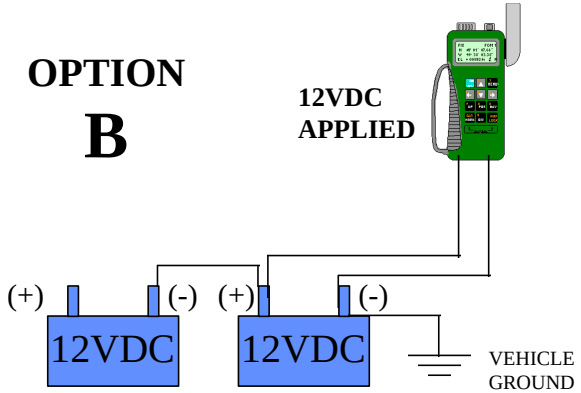
PLGR Power Connection

OPTION
A



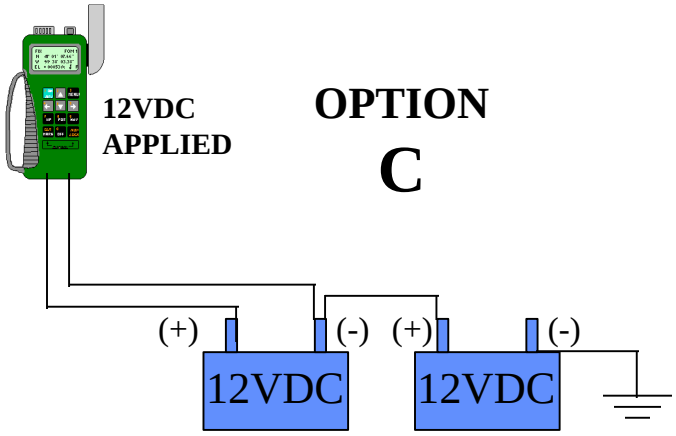
OK

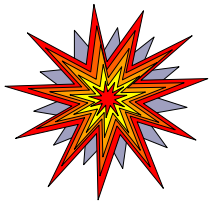
OPTION
B



OK

OPTION
C





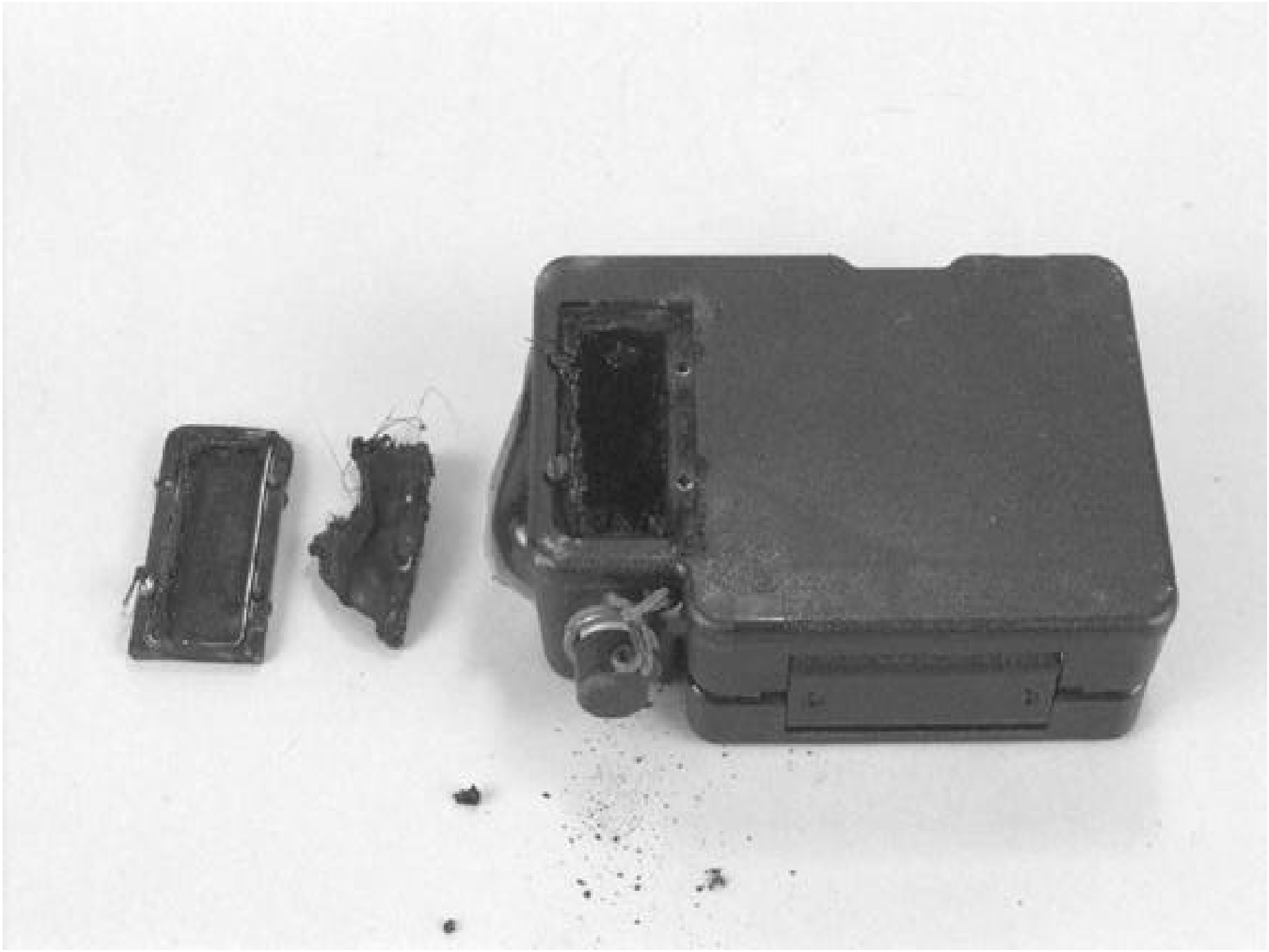
BAD!

AN/PSN-11
Memory Battery Leakage

- The PCI Eternacell TO6/51 lithium thionyl chloride memory battery (DLA) has a history of leakage in the PLGR
- Leakage occurs at end of battery life in which a residual amount of thionyl chloride remains and corrodes the cell case
- The batteries may become depleted when the PLGR is used or in storage
- Leaking thionyl chloride may damage the PLGR/cause injury
- GPM 97-004 issued requiring PCI batteries to be replaced with new batteries
- Batteries with date codes of 0997A and later are reformulated and do not require replacement IAW GPM 97-004
- Recommendations: Always remove batteries from equipment prior to long term storage - Address in TM's

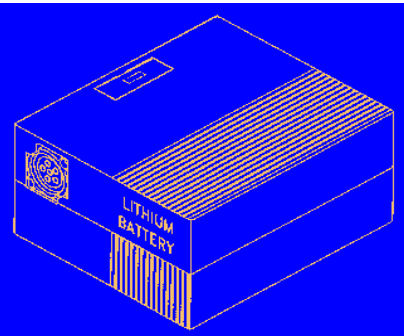
DTD/ANCD (CYZ-10) Incident

- The equipment uses three BA-5123/U or one 9v battery. These are the only authorized batteries for use in the CYZ-10
- BA-5372/U batteries were incorrectly installed in the equipment resulting in excessive heating and equipment damage
- The BA-5372/U fits in the equipment, BUT, it has the wrong polarity and higher voltage!
- Recommendations: Ensure labels affixed to battery compartments identifying proper batteries and address in TM's



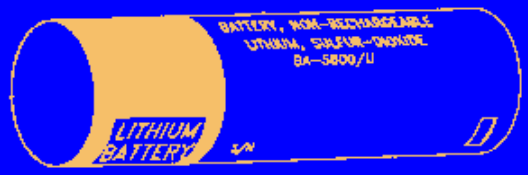

DISPLAY NEXT OR PRIOR LINE OF DATA
LAMP
MAIN MENU
RCV
SEND
ABORT
ON OFF
LOCK LTR
SPACE

SAFT BA-5590 Batteries



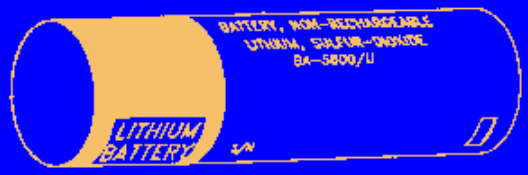
- GPM 96-013 issued to minimize ventings of SAFT BA-5590's:
- Ventings of batteries continued to occur after issuance of GPM
- SOUM 97-017 issued dead-lining SAFT BA-5590 batteries.
  - Contract numbers DAAB07-88-C-C045 and DAAB07-90-C-C020
  - Unexpired batteries being replaced by CECOM.
  - No credit for expired batteries.
- Poor Battery Management!
  - Users not rotating stock
  - Stuck with expired batteries
- Recommendations: Inform users of your battery powered equipment to practice FIFO and not use expired batteries

Ballard BA-5800 Batteries



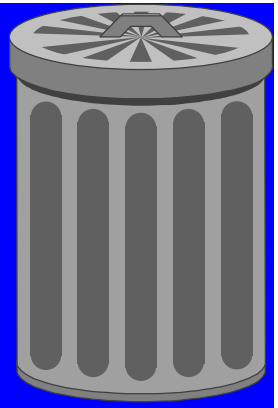
- AN/PSN-11, PLGR, is the primary user of BA-5800/U batteries
- GPM 96-012 and 97-013 provides precautions, restrictions, and disposal requirements of Ballard BA-5800/U batteries
- Violent ventings during usage and disposal processing resulting in injury continue to occur
- SOUM 98-001 dead-lines all Ballard BA-5800/U batteries under contract DAAB07-90-C-C024
  - Do not activate CDD of any of these batteries
  - Hold batteries as hazardous material until CECOM funding is available or dispose of as hazardous waste through local DRMO
  - CECOM to replace unexpired batteries only
- SOUM also provides precautions for all other BA-5800's
- Recommendations: Inform users of your battery powered equipment to return batteries for proper disposal processing

Ballard BA-5600 Batteries



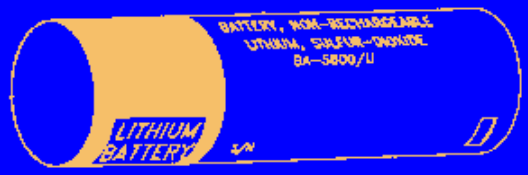
- Two violent ventings occurred during usage and testing of Ballard BA-5600/U batteries causing equipment damage
- GPM 98-002 provides restrictions with the continued use of these batteries:
  - Never use any of the subject batteries past their expiration date
  - Shut off all equipment when not in use.
  - Remove batteries from equipment if it is to be stored for longer than 30 days.
  - Secure and protect any loose batteries.
- Important disposal restrictions apply:
  - Do not activate CDD of any of these batteries
  - Hold batteries as hazardous material until CECOM funding is available or dispose of as hazardous waste through local DRMO
- Recommendations: Inform users of your battery powered equipment to return batteries for proper disposal processing

$LiSO_2$ Battery Disposal Processing



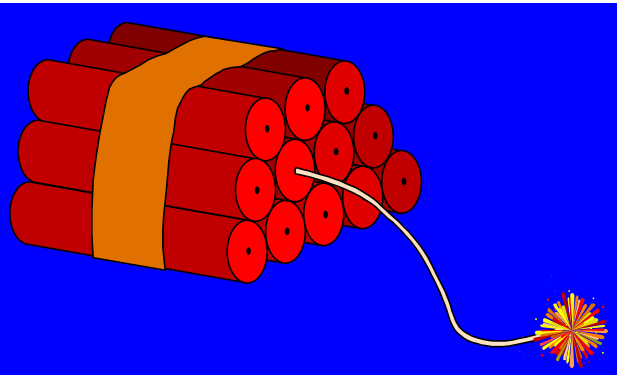
- USERS MUST NOT ACTIVATE THE CDD
- After use turn in all $LiSO_2$ batteries for proper disposal
- The following procedures are to be performed by the authorized disposal personnel only:
  - Slit or remove the CDD label
  - Gently depress CDD with small screw driver
  - Separate batteries on all sides by at least 2 inches
  - Place batteries in secure, well ventilated area for a minimum of 5 days. DO NOT HANDLE!
  - When cool to the touch measure battery voltage
  - If voltage less than 1 volt per cell - dispose of as non-hazardous material
  - If voltage is 1 volt per cell or greater - push CDD a second time, wait 5 more days, and remeasure voltage - or dispose of as hazardous material
- Recommendations: Inform battery users of these procedures - Include in TM's

Primary Battery Summary



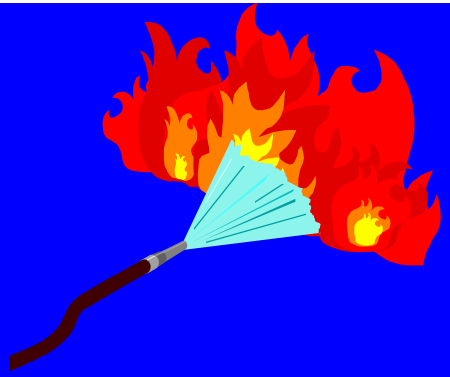
- *Replace batteries in matched sets - TM and labeling*
- *Do not rely solely on battery diodes to prevent charging - H/W*
- *Adequate installation instructions - TM*
- *Remove batteries prior to long term storage - TM*
- *Use authorized batteries only - labeling and TM*
- *Do not use expired batteries - check shelf life extensions - Web*
- *Users are not to activate CDD's - turn in for processing - TM*

Secondary Battery Issues



MSE Lead Acid Battery Incident

- MSE shelters utilize two vented lead acid batteries
- A battery compartment vent hose is used to exhaust hydrogen produced during charging to the outside of the shelter
- Battery vent hose left disconnected during maintenance
- Battery boil over generated excessive hydrogen within the shelter and exploded by a spark from the electric heater
- GPM 96-002 issued reiterating proper maintenance procedures
- Recommendations. Address precautions in TM:
  - Never charge bad batteries
  - Never operate battery charger without ventilation
  - Sealed lead acid battery replacements available



BB-390A/U NiCd Battery Incident

- The BB-390A/U NiCd battery was inadvertently installed in the MPS-5 Uninterruptible Power Supply
- The MPS-5 is designed for use with the BB-490/U lead acid battery only
- The BB-390A/U battery overheated and was damaged during charging
- GPM 97-012 issued:
  - NEVER substitute the BB-490/U (lead acid) with the BB-390A/U (NiCd)
  - Replace the BB-490/U with BB-490/U or MRC-490 batteries only
  - The BB-390/U must be charged using the PP-8444/U, PP-8444A/U, or PP-7286/U (with appropriate settings)
  - CECOM will continue to substitute the BB-390A/U for the BB-590/U NiCd battery since they are interchangeable
- Recommendations. Ensure equipment TM's specifies all possible replacement batteries

CHS-2 UPS SLAB Incidents

- The CHS-2 UPS uses two Sealed Lead Acid Batteries in a removable battery pack
- Over-discharged batteries installed in the UPS experienced swelling
- Charging swollen batteries:
  - results in excessive temperatures of the battery pack and UPS causing a fire or burn hazard
  - may cause battery rupture that sprays battery acid or ignites hydrogen
  - causes equipment damage
- Swelling of batteries prevented by keeping batteries charged
- Charge more often under high temperatures
- GPM 98-003 issued providing inspection and test procedures
- Recommendations. Ensure users of the CHS-2 UPS are performing inspection and test procedures IAW GPM

What's New and What to Look Out For

- State of Charge Indicators (SOCI) are being integrated in numerous $LiSO_2$ and rechargeable batteries
  - The SOCI provides % of remaining battery capacity in increments
  - Provides an accurate status of batteries prior to and during missions
  - Users will not need to carry or use an external state of charge meter
  - Integrated SOCI's will reduce disposal of "good" batteries in which SOC meters are not readily available
- Modified rechargeable batteries to prevent charging of primary batteries inadvertently installed in chargers
- BA-5600/U and BA-5800/U rechargeable battery equivalents
- BA-5347 batteries - $LiMnO_2$ versions of the BA-5847
- A new type of CDD - utilizes a strip under the label to be pulled out for activation